







2005
Great Basin

Seasonal Assessment for Fire Weather and Fire Danger

31 March 2005

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A. Executive Summary – Initial Assessment

Extremes of precipitation in fall 2004 and winter 2004/2005 across the Great Basin have created a two-pronged fire potential problem. Near-record rain and snow in the south will contribute to a grass fire problem while extremely low precipitation from the Nevada/Utah border northward will lead to a timber fire problem. Therefore, unless we experience an unexpectedly cool and wet spring and summer, the fire season has largely been determined by antecedent conditions. In fact, the most likely climate scenario consists of a normal spring followed by a warmer-than-normal summer with dry conditions in Idaho and wet conditions in the eastern Basin, based on expected moderate El Niño conditions.

In Nevada, high fire potential is forecast to extend throughout the Mojave Desert (roughly all of Nevada south of a line from the Great Basin National Park through Tonopah and westward to Dyer) where grasslands below 6500 feet have experienced exceptional fine fuels growth. Most of the northern two-thirds of Nevada will have normal fire potential, although a freeze, followed by additional precipitation could bring a second (or third) crop of cheat grass, significantly increasing chances for large fires. Good snowpack at high elevations and high soil moistures above 6500 feet should keep dead large fuels from being a problem until late summer, and only then if the normal monsoonal rains do not occur. Even live large fuels will be less of a factor in high elevation fires, since high soil moistures will keep live foliar moisture high also. However, an unusually hot and dry stretch could quickly deplete the snowpack and lower soil moistures, especially on south slopes.

For Eastern Great Basin, conditions in southern Utah are in large part the same as in southern Nevada. Fine fuels will exhibit loadings and continuity at elevations below 6500 feet to carry fire in the southwest corner of Utah and across the northwestern corner of Arizona (the Arizona Strip). Farther north, the timberlands of central and southwest Idaho and western Wyoming continue to suffer from long-term precipitation deficits that have increased mortality from drought stress, disease and bug infestation problems. Large fuels that likely did not recover from last fall's dry conditions also will contribute to the fire problems. Consequently, **the 2005 fire potential is forecast to be above normal across most of the forested lands in southwest Idaho and north of the Snake River Plain, the northern districts of the Bridger-Teton National Forest, and the grass and shrublands below 6500 feet in southwestern Utah and the Arizona Strip.**

The main factors that contributed to our conclusions are:

- Fall and winter precipitation has partially mitigated the long-term drought across the central and southern areas of the Great Basin (further north, especially in Idaho, severe long-term drought persists);
- One of the wettest winters on record caused extensive fine fuels growth in the southern Great Basin; and
- Drought-stressed timber has suffered from increased bug kill and disease.

Spring and summer weather will have a secondary impact on Fire Potential this season, both because extremes in weather are not expected and because fuels conditions are already well established at this point. However, an unusually hot and dry stretch could quickly cure grasslands and deplete the snowpack, lowering soil moistures, especially on south slopes. Therefore, we will have higher confidence in this outlook in 30 to 40

days when we are closer to summer and have a more complete evaluation of fuels conditions.

B. Introduction and Objectives

This outlook is our best estimate of expected conditions for the upcoming fire season. We hope to provide some scientific basis for the many management decisions that must be made. This involves using a quantitative assessment of existing conditions and a combination of quantitative and qualitative forecast methodologies for the remainder of the spring and summer months to arrive at a subjective assessment of overall fire season potential. It is important to note that fire season severity in this outlook can only be discussed with regard to potential since there is a myriad of factors affecting the total number of fires, acres burned and firefighting resources needed which cannot be predicted with any degree of confidence this far in advance.

C. Current Conditions

Drought, Precipitation & Temperature.

Drought. The first 6 months of the 2004/2005 water year have been a time of stark contrast to earlier years. Abundant rainfall and snowfall have sharply impacted drought conditions and have provided a surprisingly early green-up in southern Nevada and all of Utah. During a very warm 2004 summer, occasional rainfall kept fire season down to a very moderate level, and ended it with finality in October with heavy rains. A cool and wet storm track was established in early winter of 2004 and continued with periods of significant rain and snowfall each month through March of 2005. During that period, total precipitation averaged 150 to 200% of normal in northern and central Nevada and Utah, with 250 to 400% of normal in the southern third of each state.

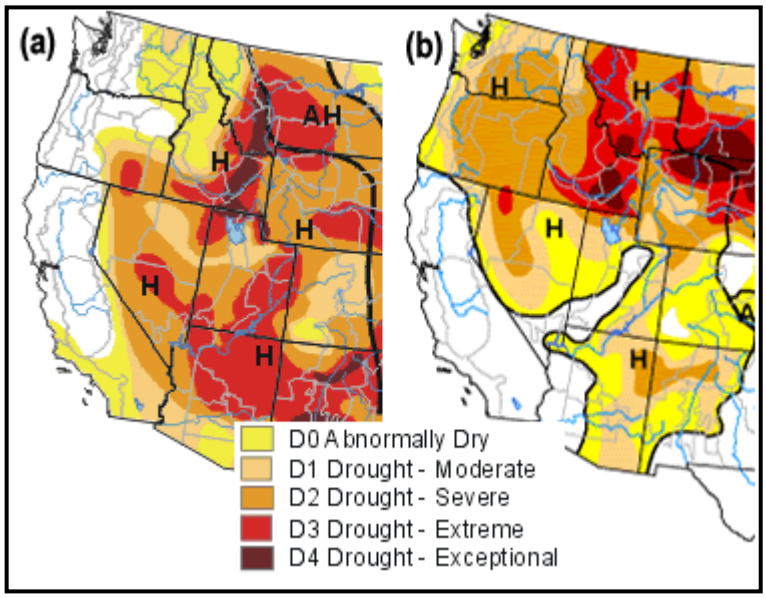

Figure 1. Drought conditions for western states for (a) 30 March 2004, and (b) 29 March 2005. (from U.S. Drought Monitor, http://drought.unl.edu/dm/)

Idaho, because of the lack of winter snows and early melt, worsened across the west to severe drought while south central and eastern Idaho remained or worsened to extreme or exceptional drought (Figure 1). Western Wyoming remained in severe conditions.

Long-term (4-6 year) precipitation deficits continue to be a problem for the entire Great Basin, though marked reduction has occurred. Long-term precipitation deficits are typically only reduced by much above-normal winter precipitation over several years. Thus drought conditions are less severe this year than last year (see the U.S. Drought Monitor, March 2005 and March 2004), but drought is expected to continue over most of the majority of Great Basin due to residual effects of precipitation deficits from 2003 and earlier years.

Temperature. Temperatures continued on the warm side of normal for 2004 with Idaho leading the way. The mean annual temperature in Idaho was the 11th warmest on record (over the last 110 years), with Nevada having its 14th warmest year. The winter season (December, 2004, to February, 2005, Figure 2) was warmer than normal for all the Great Basin with Wyoming recording its 6th warmest winter and Utah its 11th warmest winter ever. Idaho and Nevada were in the top 20 percent of warmest winters.

Precipitation. Precipitation patterns across Eastern Great Basin were a study of two extremes, especially the winter months of December, January and February. The north was dry, with Idaho having the 13th driest winter on record (Figure 2) and the 3rd driest February. In contrast, Nevada and Utah (particularly the southern third of the state), were extremely wet. Beginning in October, heavy rains and snows pounded the Great Basin, causing widespread areas of severe flooding and many areas of record snowpack. The Nevada winter was the 2nd wettest on record with Utah having its 3rd wettest winter. Western Wyoming was near normal, although a mild, late winter took an early toll on snowpack in the Bridger-Teton forest.

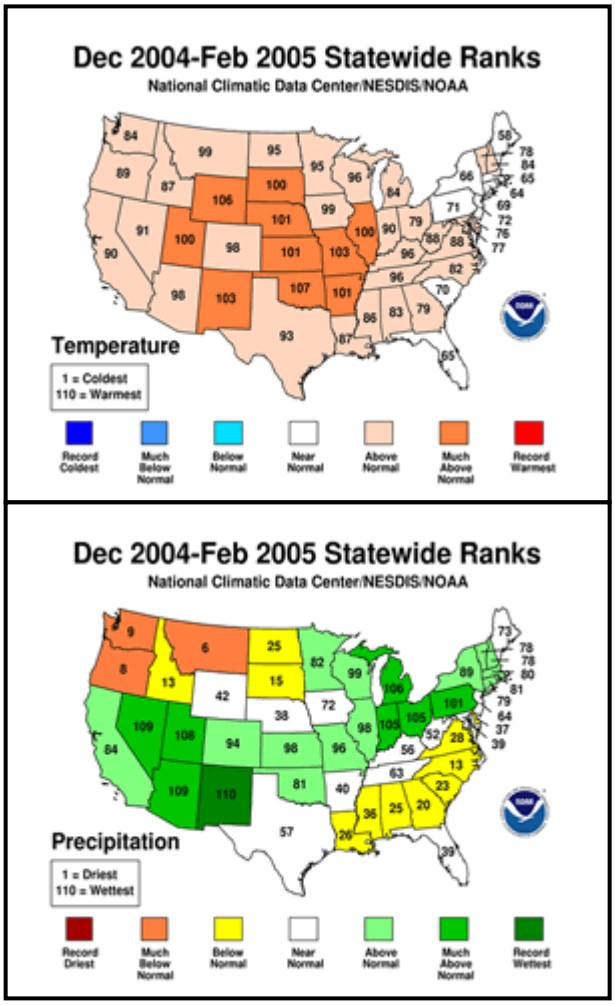

Figure 2. Statewide rankings of temperature (top) and precipitation (bottom) for winter season, December, 2004, to February, 2005. (from National Climatic Data Center)

Snowpack: Snowpacks (Figure 3) were below normal throughout the winter in Idaho and extreme northern Nevada. A dry February exacerbated conditions with warm spells that quickly depleted existing snowpack to between 40 and 60 percent of normal by the 1st of March. This was quite a contrast to the previous winter when Idaho snowpack was up to 125 percent of normal. Utah and most of Nevada benefitted from an extraordinarily wet winter. At times, the snowpack in southern Utah was as much as 400 percent of normal.

Even with some snow losses from warmer temperatures in the middle of February, by the 1st of March, the snowpack in most of Nevada and all of Utah was approximately 150 to 200 percent of normal.

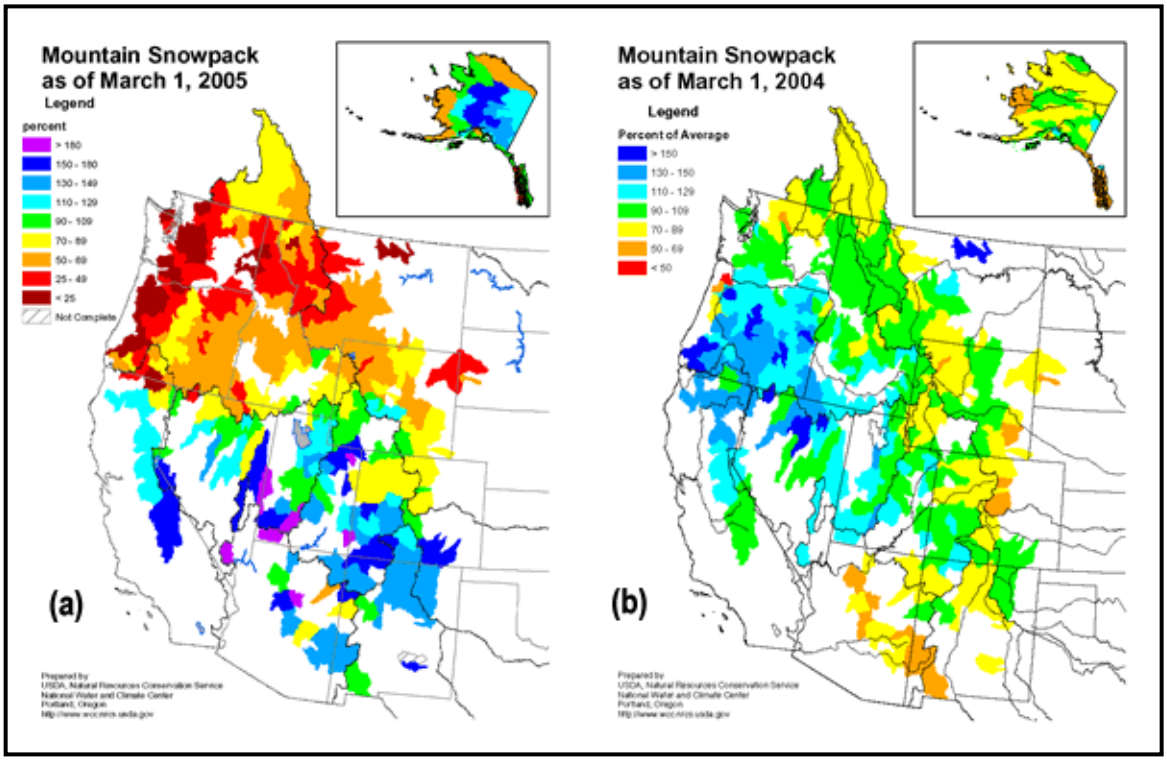

Figure 3. Comparison of snowpack through 1 March for (a) 2005 and (b) 2004. (from Natural Resources Conservation Service).

Standardized Precipitation Index (SPI): The current episode of drought gripping much of the western United States began nearly 5 years ago (Figure 4) and appears to have peaked in intensity during mid 2002. Since that time, an increase in rainfall starting near the end of 2003 continuing into the present (24 month and 12 month SPI) has lead to a noticeable reduction in extreme drought conditions in Nevada. Southern Utah received significant relief during the past six months. Unfortunately, the same is not true for Idaho. A period of very dry conditions for Idaho has only intensified the impacts of long-term precipitation deficits.

The SPI is the number of standard deviations the observed value would deviate from the long term mean. In other words, it is method for normalizing precipitation values across areas where normal precipitation varies by orders of magnitude. This makes comparisons easier and more meaningful across different climatic regions. The SPI is calculated on a range of time-scales, covering the last 1, 2, 3, 4, 5, 6, 7, 8, 9, 10, 11, 12, 15, 18, 24, 30, 36, 48, 60 and 72 months.

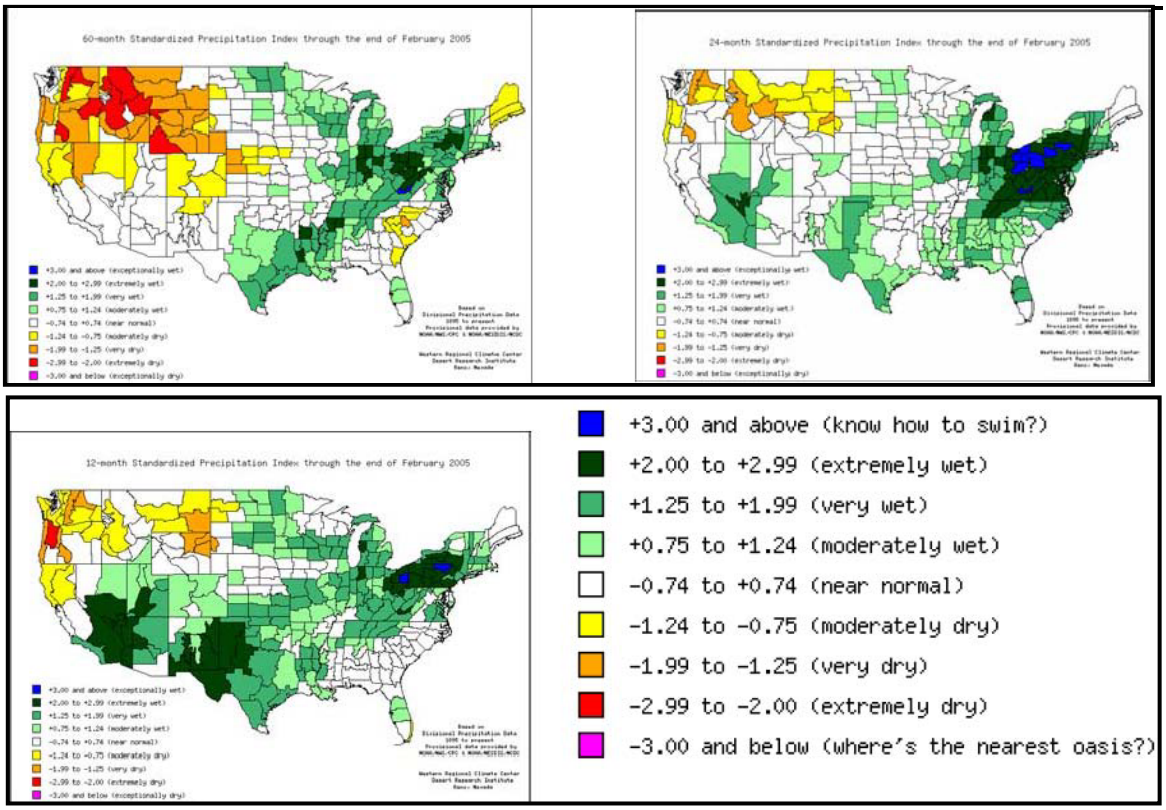

Figure 4. Standardized Precipitation Index (SPI) for the last 60 months (top left), 24 months (top right) and 12 months (bottom left) ending February, 2005 (from Western Regional Climate Center, Desert Research Institute).

Soil Moisture. Abundant rainfall, combined with a deep snow pack, has increased soil moisture to above-normal levels for the southern 2/3 of Nevada, parts of Wyoming and nearly all of Utah (Figure 5). After a short warmup in early March, cool temperatures have maintained the snowpack above 6500 feet and aided in keeping high levels of surface
soil moisture in the southern parts of the Great Basin. More rainfall expected this spring should allow soil moistures to remain near these levels through early summer.

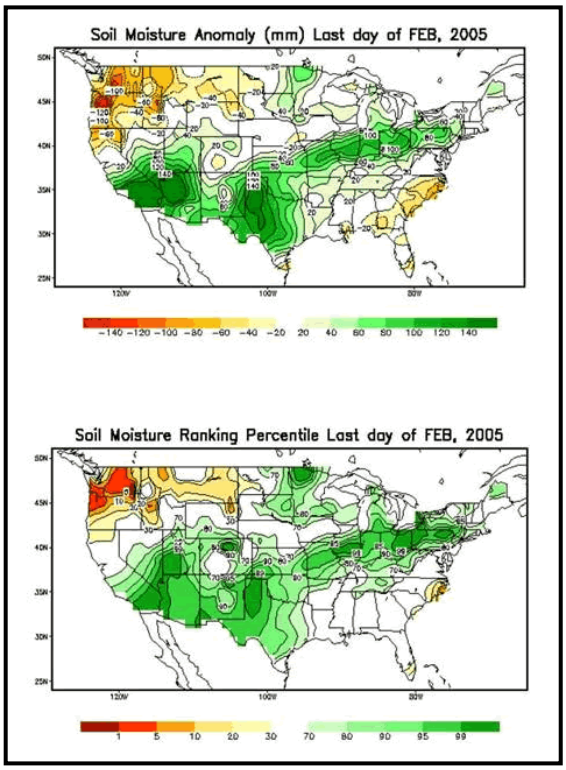

Figure 5. Soil moisture anomaly (top) and soil moisture ranking by percentile (bottom) for last day of February, 2005 (from NOAA/NWS Climate Prediction Center)

Fuels Analysis. Specific fuels condition factors could not be accurately assessed in late March when this assessment was prepared. A follow-up assessment in late May will address fuel conditions and fire potential with more certainty. Critical elements include: timing of snowmelt; timing of green-up across the profile; duration and amount of spring precipitation; continued drought conditions and other related parameters.

Persistent drought since 1999 has created progressively drier fuels each season. The 2004-2005 winter produced below normal snowpack in the north and above normal snowpack in the south. This mitigated the drought significantly in the south and but worsened it in the north. Brush and timber fuels remain drought stressed in the north and continue to experience drought related mortality, intensified by insect infestations. In the southern areas drought and insect related mortality in pinyon, juniper and chaparral fuels appears to have slowed considerably while continuing in timber fuels.

Southern Great Basin. In low elevation areas (below 4000 feet) of northern Arizona, southern Nevada and south and central Utah, green-up occurred as early as December following fall rain events. Fine fuels continue to become more prolific and robust with saturated soil conditions. Carryover fuels were not compacted by snow below 4000'. Fine fuels in range areas above 4000' and up to 6500' are just beginning to manifest.

At higher elevations (above 6500 feet) of northern Arizona, south and central Nevada and south and central Utah, the early October storm brought record amounts of rain which thoroughly wetted heavy dead fuels prior to season freeze and snowfall. Large amounts of snowfall occurred throughout the winter in a steady stream of storms. Snowfall amounts and snow water equivalents are 150 to 200 percent in these areas. Snowmelt will be slow to come off of these fuels simply because of the abundance of snow and not necessarily timing of warming weather. Complete snowmelt may be as late as mid-June with drying taking up to an additional 1-2 months in 1000-hour and larger fuels. We expect a late, abbreviated season in this fuel type.

Central Great Basin. Northern Utah and Nevada experienced a near normal winter. Early green-up began as early as mid-February for elevations less than approximately 5,000 feet.

Northern Great Basin. In the northern Great Basin (including southern Idaho and the Bridger-Teton/Grand Teton area of Wyoming), below normal winter precipitation has resulted in discontinuous, sparse fine fuels at lower elevations and very dry timber fuels at higher elevations. Forests in Idaho have experienced an early, active prescribed fire season in timber and currently are at < 30% of normal snowpack. Spring 1000-hour fuel moistures match fall levels of 12-16%, i.e., no winter recovery in heavy dead fuels.

Figure 6 shows departure from average greenness in March, 2005 compared to March, 2004. Although most of the state has little change compared to last year, it can be easily seen that the southern parts of Nevada and central Utah are seeing more active growth this spring. In fact, southern Nevada has greenness values comparable to the heavy active growth seen in the spring of 1999.

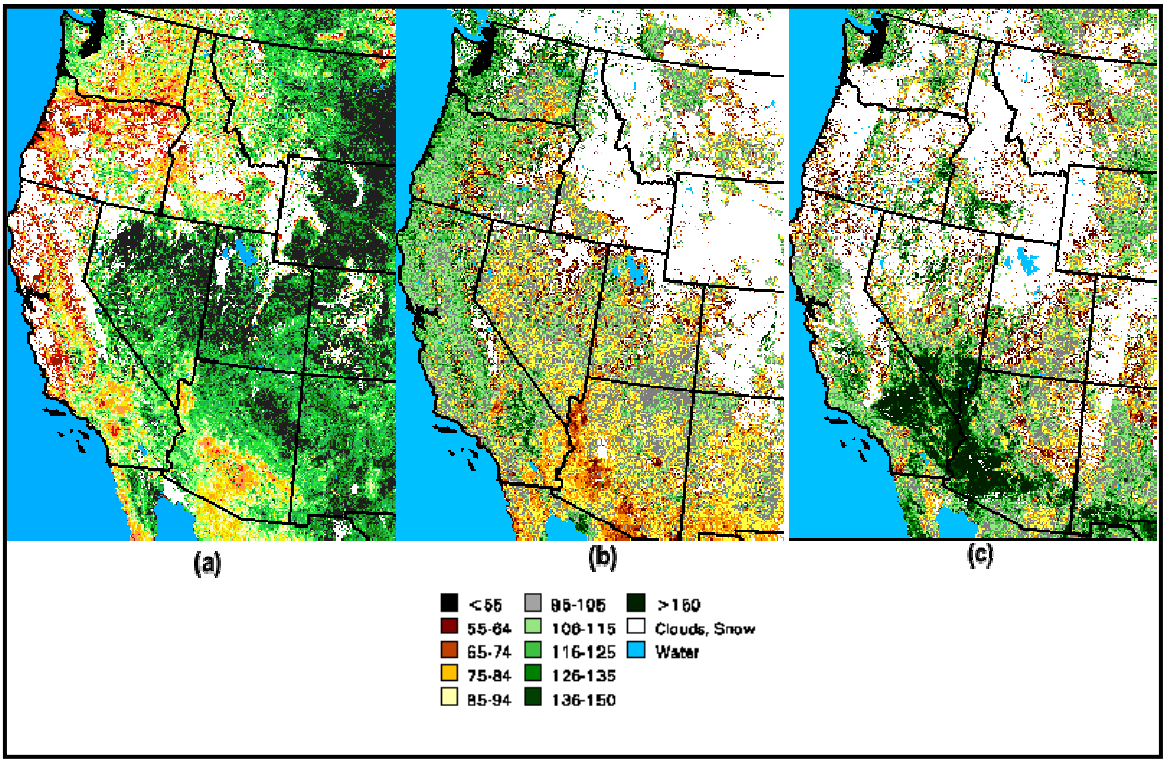

Figure 6. Departure from average greenness for (a) March, 1999, (b) March, 2004, and (c) March 2005. (from Wildland Fire Assessment System, USDA FS)

This exceptional grass and shrub growth in far southern Nevada can be illustrated by photos (Figure 7) of Saharan Mustard near Highway 95 between Henderson and Boulder City:

Figure 7. Saharan mustard growing along Highway 95 between Henderson and Boulder City, NV.

Drought and Insect Mortality. Prolonged drought conditions throughout the Great Basin have left fuels susceptible to opportunistic insects and disease.

Eastern Great Basin Shrublands. In southern Utah and northern Arizona, drought induced mortality in chaparral, pinyon and juniper appears to have slowed significantly. The peak of this drought-induced mortality occurred in 2003, manifested in the large amounts of red needles and leaves visible across the landscape. These fuels have dropped their needles and leaves and appear as numerous skeletons, presenting less of a control problem without aerial fine fuels but still available to contribute to fire intensity. Figure 8 illustrates the difference between the shrub fuels in 2003 (a) versus 2005 (b). Note the increased green-up and loss of needles and leaves in the lower photo. High soil moistures will increase robustness in brush fuels and contribute to the decrease in pinyon beetle mortality. Brush, pinyon and juniper mortality will continue in the northern areas of the Great Basin as long as the region continues to suffer from precipitation deficits.

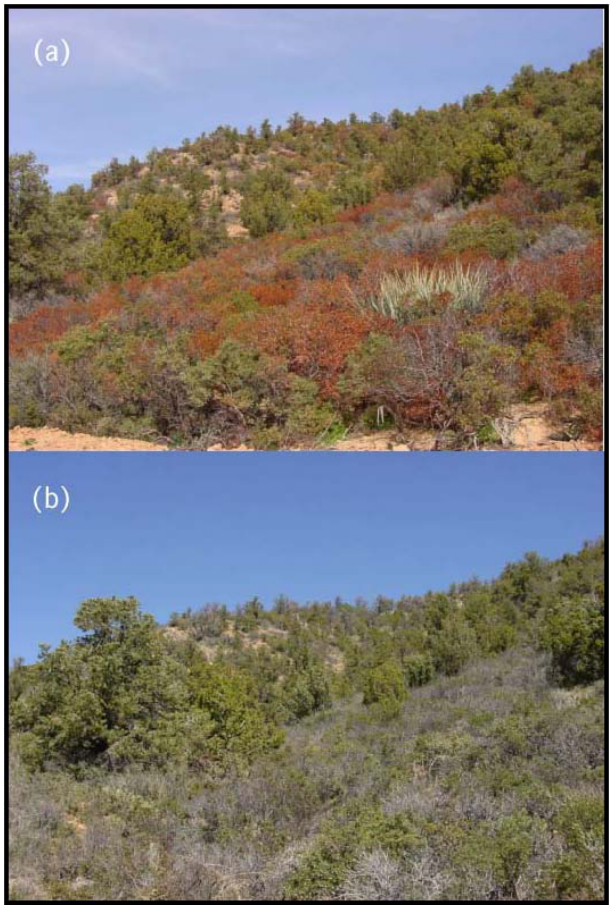

Figure 8. Photos of shrub fuels in (a) 2003 versus (b) 2005. (courtesy of Cyndi Sidles, Dixie National Forest, USDA FS)

Eastern Great Basin Forests. Mortality in timber continues to increase in all of the forested regions of the Eastern Great Basin, reaching epidemic levels in many areas. Areas with intact red needles have high potential for crown fire. These heavy dead fuels become less of crown fire threat with loss of needles, but continue to contribute to high fire severity and intensity.

Figure 9, from the Forest Health Protection's Annual Aerial Insect and Disease Detection Survey, shows tree mortality evident throughout the forested areas of Eastern Great Basin and appears to have increased significantly from last year's mapping effort. These areas will pose the greatest resistance to control, especially in forests of Idaho and Wyoming where extreme drought conditions persist coupled with epidemic levels of beetle-caused mortality. In the south, heavy dead fuels will likely not dry out until mid to late August.

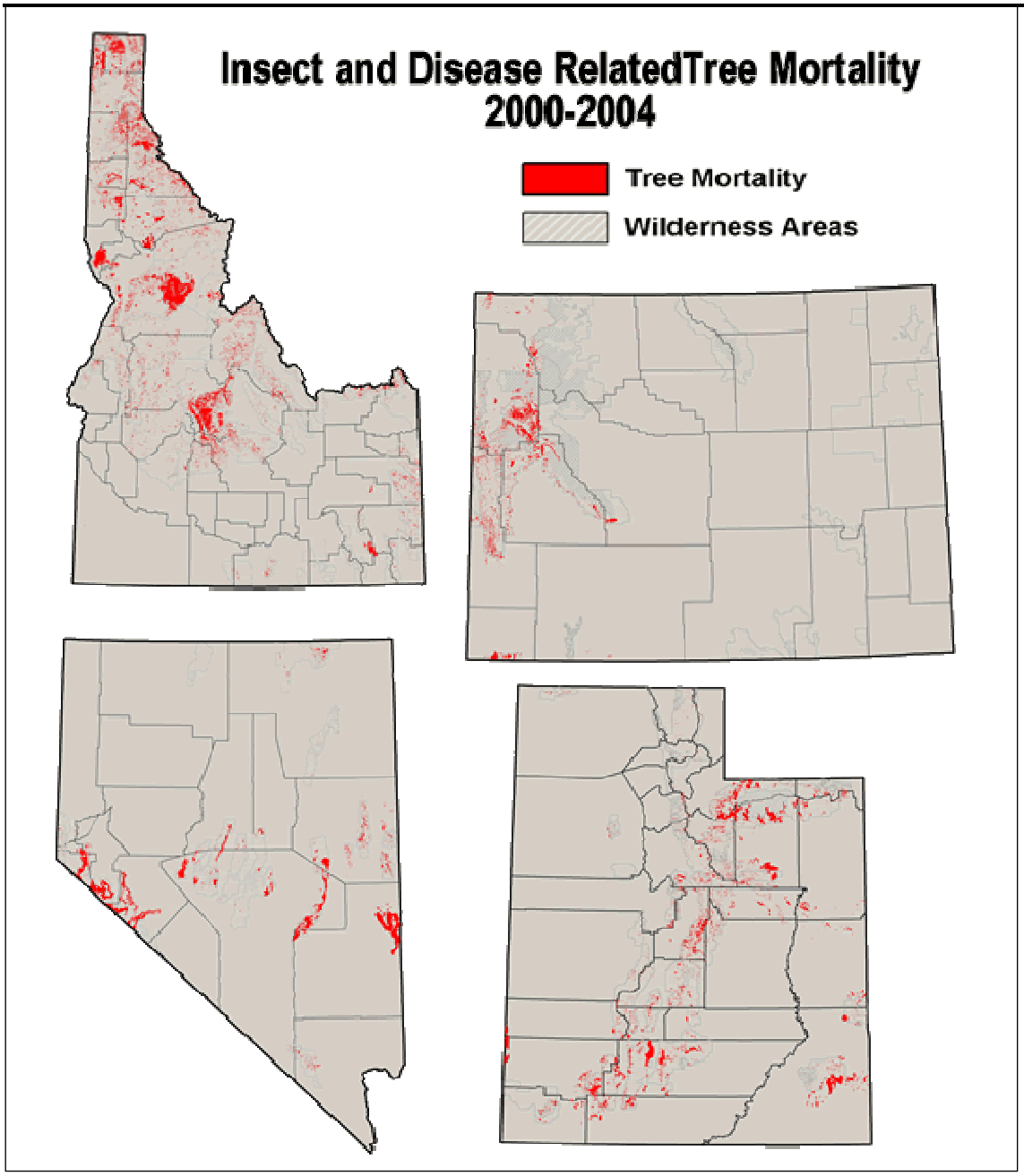

Figure 9. Insect and disease related tree mortality during the period 2000 – 2004 for (clockwise from top left) Idaho, Wyoming, Utah and Nevada. (from *Annual Aerial Insect and Disease Detection Survey*, Forest Health Protection, USDA FS)

Western Great Basin. Significant mortality, especially in Pinyon pines (Pinus monophylla) is being seen in the upper elevations east of Caliente and Pioche in Lincoln County, the Grant and Quinn Canyon Ranges of eastern Nye county, and the Pine Nut Range in western Nevada. Less significant die-off has also been noted in the Schell and Egan Mountain Ranges in White Pine County, the Toiyabe Range in central Nevada, the Virginia Range in Storey County and the Jarbidge Mountains in Elko County. Even with significant summer rainfall last year and sufficient precipitation this past winter, tree

mortality expanded from 2003 to 2004, but should moderate in 2005 with reduced drought stress.

D. Outlooks - Eastern Great Basin.

Climate and Weather Outlook. The consensus scenario used below is based on the Climate Prediction Center's (CPC) seasonal forecasts and modified using updated sea-surface trends in the eastern Pacific to produce the consensus scenario (see Figures 10 and 11, pages 15-16).

The spring season for Eastern Great Basin (April – June) is expected to be near normal in both temperature and precipitation. The significance of this is its impact on snowmelt over the next 3 months. In Idaho, low snowpacks will most likely be gone well ahead of the norm, as much as 4-6 weeks ahead of schedule. Wyoming will be slightly slower but still as much 2-4 weeks early. Conditions in Utah will vary greatly from north to south. In northern Utah, near to slightly above normal snowpack in late March will follow a normal spring melt, coming to completion by mid to late May. Farther south, however, where snowpack is still 150-200 percent of normal, snowpack will be delayed several weeks, possibly remaining as late as mid to late June. These varying rates of snow melt in the region will create a large stratification in fuels availability from north to south throughout the summer.

The summer season (July – September) is expected to be near normal throughout with the exception of Idaho toward the end of the period. Projections suggest that a strong positive height anomaly (i.e. stronger high pressure) will develop over the northwest, creating warmer than normal conditions, primarily into late August and September. Consequently, below normal precipitation is expected in Idaho, where extreme to exceptional drought conditions will only worsen. In Utah, mid to late summer moisture is expected to shift eastward, increasing the probability of above normal humidity in the eastern parts of the state. This could also produce above normal precipitation from increased thunderstorm activity.

Fuels Outlook. Fuels outlooks will be addressed in the scenarios below.

Fire Occurrence and Resource Outlooks. See individual scenarios (below) for fire occurrence discussions. It is too early to make estimates of expected resource needs.

Future Weather Scenarios. Two scenarios are presented that could characterize the 2005 fire season in the Eastern Great Basin: (1) normal spring with a trend toward warmer summer but drier in Idaho and wetter in eastern Utah, or (2) a wet spring followed by a normal to warmer than normal summer.

Most Likely Scenario: Normal spring with warmer late summer, drier Idaho and wetter eastern Utah. Given current snowpack variations across the Eastern Great Basin, this scenario will have varying impacts across the region. In general, the northern forested areas (central and northeast Idaho, western Wyoming) will likely have an above normal fire potential resulting from prolonged precipitation deficits, early snow melt, and the disease and bug infestations. Utah forests have benefited from significant precipitation and will have a normal to slightly below normal fire potential. Grasslands

will generally be normal except in southern parts of Utah where heavy rain will contribute to heavy fine fuel loadings.

Rangelands/Shrublands: In shrublands and grasslands the availability of fine fuels is a primary contributor to fire occurrence. Several issues come to play in assessing fine fuels for the lower elevations including 1) new fine fuel growth/loading, 2) degree of compaction of carryover fuels, 3) time of curing of fine fuels and how this affects length of season, and 4) shrub mortality.

Under this scenario in the south, range and shrublands would expect an above normal fire season due to heavy fine fuel loading, warmer temperatures and an eastward shift to the monsoon moisture. Wet winter and early spring weather has contributed to prolific fine fuel growth across the Arizona Strip and southern and central Utah. A dry winter in northern grasslands and shrublands has stunted fine fuel growth and a normal spring will likely not produce heavy fine fuels.

Fines fuels across southern Utah and the Arizona Strip are only beginning to cure at the lowest elevations (<3000 feeet). Above 3000 feet fine fuels are green and continue to grow. Green-up is only just beginning at the higher elevations from 5500-6500 feet. Normal curing timing is expected across the Great Basin with a normal rainfall and temperature scenario. Carryover fine fuels from 2004 will still be available to burn in 2005, particularly in low elevation areas (<4,000 feet) where these fuels were not compacted by snow.

In southern Utah and northern Arizona, dense brush fuels with continuous fine fuel understory will continue to support large fire growth under windy conditions. High rates of spread are the biggest concern for initial attack. A normal spring and summer in the southern areas of the GACC will see the concentration of the fire season in June and July under normal conditions. These fires tend to become more controllable as moisture increases in the atmosphere with monsoon onset. Rain is not required for a fire-ending event in these fuels.

Forests/Woodlands: A normal spring with a generally normal summer would result in above normal fire potential over the northern forests of Eastern Great Basin. Southern forests will be slow to dry from abundant winter snowfall and experience a late start to a normal fire season; therefore, an abbreviated fire season.

Low live and dead fuel moistures in the northern areas will increase potential for extreme fire behavior, similar to that seen in Utah in 2002 and in Idaho in 2003. Timbered areas in the south will experience a short, late normal fire season due to abundant snowfall and time required to dry out these 1000-hour fuels. Heavy dead fuel loads are the primary reason to call it a normal season.

In the north, normal spring rainfall comprises some of the wettest months for some areas, but will not be enough to compensate for long term drought, and below normal dry winter, particularly in areas of high mortality. Lack of winter precipitation prevented large fuel moistures from recovering. Thousand-hour fuels have been measured on spring prescribed fire units in Idaho as low as 12%, and a normal spring and summer this year may result in extremely low dead fuel moistures. Low dead fuel moistures led to severe fires in southern Idaho in 2003, and this trend is likely to continue under this

scenario. Lack of snow and earlier green-up will lead to another early fire season at higher elevations, much like that seen in 2002.

Record setting NFDRS indices (similar to the 2002 fire season) are expected across the northern Great Basin for 2005. In grass and shrub fuels, the total number of fires and acres burned within the Great Basin Area would be expected to be at or slightly above normal in the south and below normal in the north under this scenario. In timber fuels, average to above average potential exists in the northern areas and normal to below normal potential in the south. This scenario would predict a late start in southern areas and an early start in northern areas.

Worst Case Scenario: A wet spring followed by a normal to warmer than normal summer. A wet spring leading into a dry summer would produce above normal fire potential region-wide with the exception of the south and central forests.

Rangelands/Shrublands: A wet spring of prolonged, above normal precipitation (through May) would stimulate fine fuel growth across the Great Basin. Increased germination of annual grasses would result in greater continuity and fine fuel loading, contributing to increased potential for large fire growth. Higher moisture content would cause some grass and brush types to act as a barrier to fire spread during early summer.

Forests/Woodlands: At higher elevations in the north, fire season onset would be expected at a normal date in the timber fuel types, narrowing the window of opportunity for exceeding normal fire occurrence. A wet spring would have only a short-lived effect on moisture recovery in the heavy fuels in the midst of current long-term precipitation deficits. The 1,000-hour fuels would continue at record low moisture levels, although some improvement could be expected in this scenario. The potential for large fires would remain high, albeit in a narrower window of opportunity. In the south, already wet, large fuels from the heavy winter precipitation would not be greatly impacted by the additional moisture. This situation in the south would be similar to the previous scenario.

The total number of fires and acres burned within the Great Basin Area would likely be above normal under this scenario. With heavier fuel loadings in the fine fuels, fires will exhibit greater intensity and resistance to control, causing increased demand for suppression resources. Greater continuity in the fine fuels will result in larger, potentially more complex fires. Brush fuels would likely cure later and may help to retard fire growth in the early part of the season. At higher elevations, fire season onset would be expected at a more normal date (July-August) in the timber fuel types, narrowing the window of opportunity for exceeding normal fire occurrence. Nonetheless, the potential for large fires will remain high in the north, albeit in a narrower window of opportunity.

Management Implications and Concerns. Areas of primary concern for the Eastern Great Basin are the timbered areas of Idaho and Wyoming and the grass/shrublands of the Arizona Strip and southwestern Utah.

At lower elevations in the south, above normal winter precipitation and warm temperatures brought on an early and continuing green-up. This has resulted in good horizontal continuity and vertical growth. In this fuel type, the stage is set for potential problem fires with a normal spring and summer outlook during hot, windy conditions. These fires are typically concentrated in June and July and tend to taper off in August with increasing atmospheric moisture. On the Arizona Strip and in southern Utah, many

roads were washed out or comprised during heavy winter storms. Most of these will not be improved prior to the beginning of fire season. It will be important to make these areas known to managers and ground personnel to allow extra time for arrival on fires.

Timbered areas in southwest Idaho, areas north of the Snake River Plain and the Bridger Teton area of Wyoming have above average potential for the 2005 fire season. Long term drought coupled with below normal snowpack and high mortality has set the stage for a potentially active fire season. Land managers should expect to see more large fires that exhibit extreme to advanced fire behavior, long-range spotting, and are more difficult to control. Higher intensity fires will create unusually high rehabilitation requirements.

As the need for additional resources rises, fire managers must be cognizant of experience levels of crews and the number of individuals in new locations and positions. Fire managers and crew leaders should objectively and honestly monitor their crews' abilities and experience levels to emphasize safety and training through the season.

Daily crew briefings should include information on local fire weather and current fire behavior conditions. Specific information should include expected fire behavior, rates of spread, fuel conditions, burning index and/or energy release component, and appropriate firefighting tactics and strategies. Local pocket cards for representative fire danger rating stations should be available to firefighters.

E. Outlooks - Western Great Basin

Climate and Weather Outlooks. Climate projections for April through June indicate a fairly high degree of uncertainty this upcoming year due to the uncertainty of another El Nino occurring in 2005. There are indications that another El Nino will be emerging across the equatorial Pacific within the next few months. Thus two scenarios have been developed, one which includes an El Nino impact and one which does not. The forecast of temperature below from the CPC forecast (left image) for April, May and June does not include the El Nino and is generally based on long term trends in temperature experienced across much of the western US for the last 20 years or so. The East Pacific Warm Scenario (right image) takes into account a resurgence of the weak El Nino experienced during the last 8 months and continues its influence into the summer of 2005.

Temperature Outlook. One important note to be mentioned is that the East Pacific Warm Scenario does not include any impact from well established trends of warmer than normal temperatures across the western US. The most likely outcome will probably be some combination of the two scenarios, especially when temperature impacts are being forecast. Thus the most likely outcome is that during the April-May-June period, temperatures will be normal to slightly above normal with the warmest temperature anomalies across the western side of Nevada. Temperatures during the summer months of July-August-September will continue the pattern of slightly above normal temperatures across much of Nevada, which is supported by both scenarios.

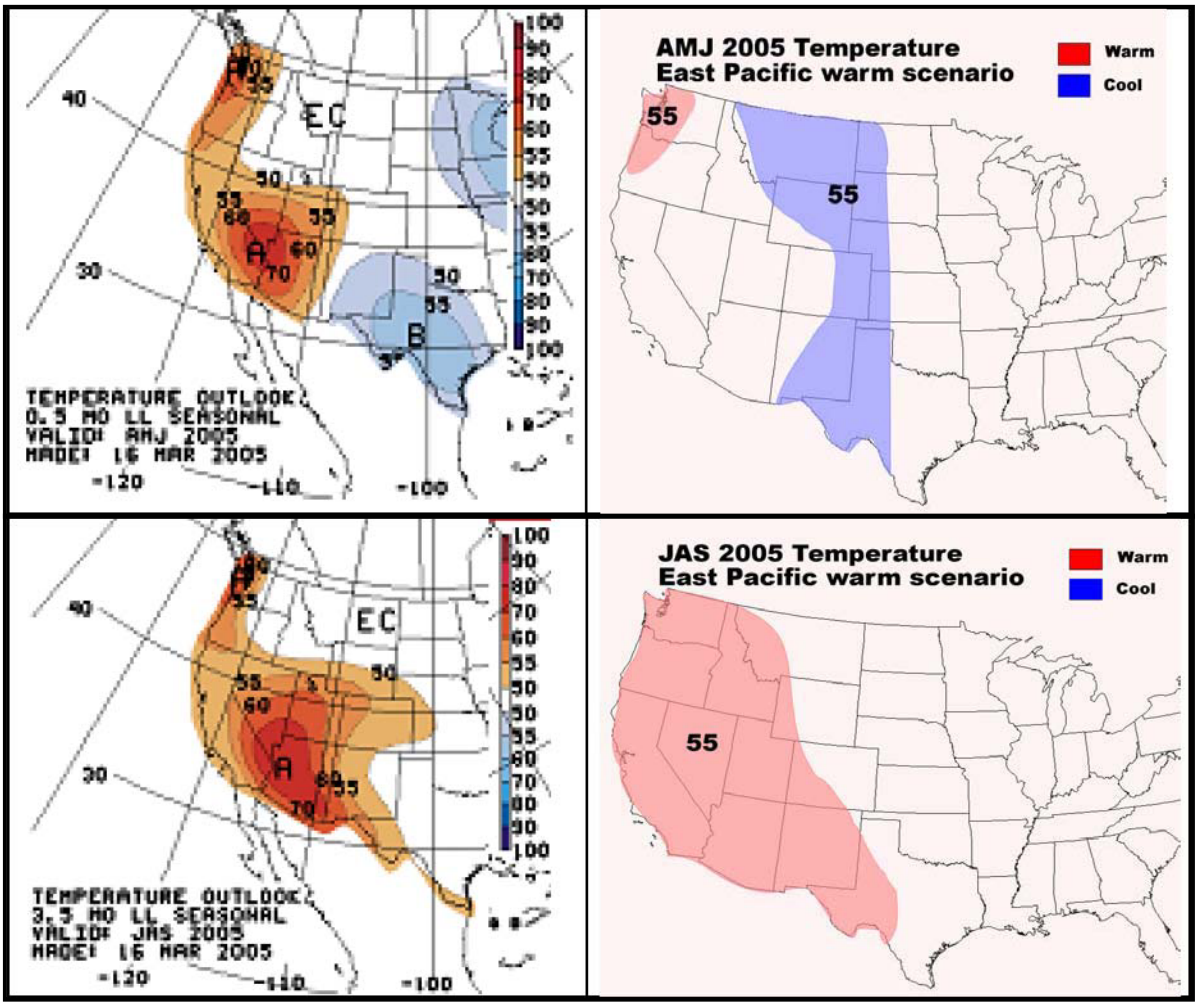

Figure 10. Seasonal temperature outlooks from Climate Prediction Center (left) and consensus scenario from Seasonal Assessment Workshop (right) for April-June (top) and July-September (bottom).

An additional attempt has been made to understand the month to month variability of temperature in Nevada. Using a set of analog years, a monthly forecast has been developed by Western Great Basin meteorologists. The user of this information needs to note that this is just an estimate on our part and has not as of yet been shown to be statistically skillful, so **the following temperature estimate is provided for information purposes only.**

Temperature Estimate – Monthly. According to the analog years we studied, expected temperatures in April, May and June are near normal across most of Nevada with slightly above normal temperatures likely in the west during April and June. During July there seems to be a strong signal for above normal temperatures statewide, followed by a return to more normal temperatures in August and September.

Precipitation Outlook. For precipitation, a similar dual scenario has been developed utilizing the same El Nino forcing mechanisms and does indicate some significant differences during both the spring and summer seasons.

The main spring season difference between the two scenarios is a significant increase in precipitation in the East Pacific Warm Scenario during the April-May-June time period in far southern Nevada and a shift away from drier than normal conditions for the rest of the state during July-August-September. The East Pacific Warm Scenario is very likely if the El Nino resurges during the spring as it resembles a continuation of the same pattern the region is currently experiencing. It also shows that during the summer season the area of below normal precipitation across much of Nevada shifts northward to the Pacific Northwest. This is likely the result of an increase in monsoon moisture during the month of August 2005, similar to what we experienced in August of 2004. Confidence in one outcome or another is low for this time period.

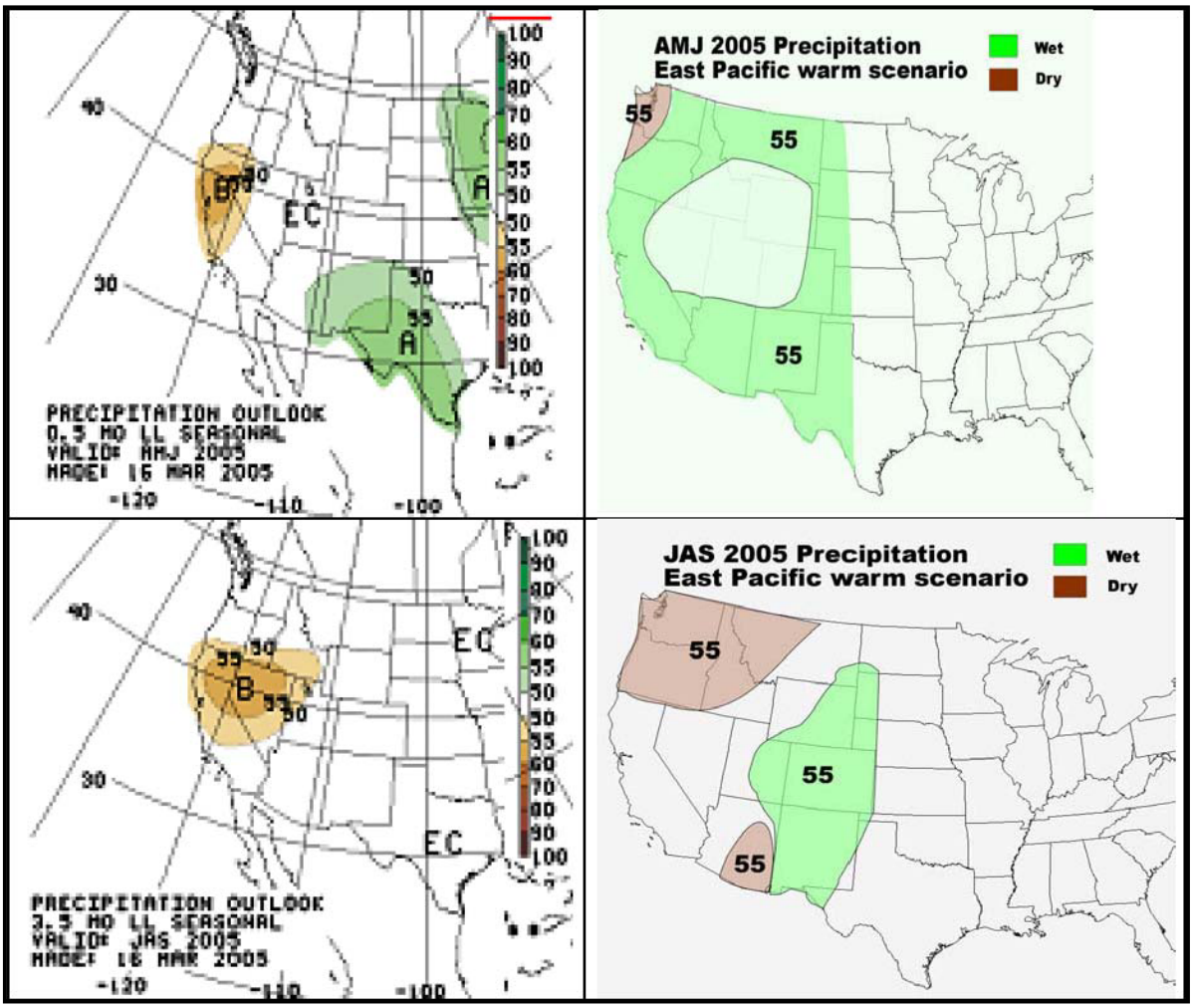

Figure 11. Seasonal precipitation outlooks from Climate Prediction Center (left) and consensus scenario from Seasonal Assessment Workshop (right) for April-June (top) and July-September (bottom).

An attempt has also been made to understand the variability from month to month in the distribution of precipitation. Using a set of analog years, a monthly forecast was developed. The user of this information needs to note that this is just an estimate on our part and has not been proven statistically valid. **The following precipitation estimate is provided for information purposes only.**

Precipitation Estimate – Monthly. According to the analog years studied, monthly rainfall in April is likely to be above normal across western and southern Nevada with more normal conditions elsewhere. In May, an area of dryness is expected to expand across parts of northern Nevada while the wetter than normal trend continues across the south. During June, precipitation may be above normal across much of central Nevada while the remainder of the state tends toward normal. The month of July is likely to be the driest month of the spring/summer season with normal to dry conditions expected statewide. During August the monsoon is once again likely to surge northward into Nevada bringing wetting thunderstorms and above normal precipitation to much of northern Nevada and near to slightly below normal precipitation to southern Nevada. September will likely be close to normal across much of the state.

Future Weather Scenarios and Probabilities. Three scenarios are presented that could characterize the 2005 fire season in the Western Great Basin: (1) a normal to wet spring leading into a normal, slightly warmer summer and summer, (2) a change to a dry & warm spring, leading into a normal, slightly warmer summer or (3) a cool wet spring leading into a warm and dry summer with frequent dry lightning episodes.

Mostly Likely Scenario: Normal to wet spring leading into a normal to slightly warmer than normal summer with a tendency for lightning to be associated with wetting rainfall. (50% Probability)

A normal to wet spring with a generally normal to slightly warmer than normal summer would result in above normal fire potential across southern Nevada and a normal fire potential across most of northern Nevada.

Grasslands/Shrublands: In shrublands and grasslands of Nevada, the availability of fine fuels is a primary contributor to fire potential. Several issues come to play in assessing fine fuel availability for the lower elevations including: 1) new fine fuel growth; 2) degree of compaction of carry-over fuels; and 3) time of curing of fine fuels and how this affects length of season.

Significant winter season rainfall has lead to a considerable annual fine fuel crop in many areas of southern Nevada and a less significant but continuous crop of annual fuels across the north. Current observations from southern Nevada are being described as “looking like Ireland” with heavy green fine fuels in normally barren areas. Rainfall last year lead to an average crop of fine fuels in some areas of Nevada, though above average snowfall in many areas this past winter resulted in compaction of carry-over fine fuels…with the exception of the lower valleys across the south.

Early green-up and the potential for normal to above normal spring precipitation will allow for more growth of fine fuels across the north and a delay in the curing of the fuels across the south, which in recent years has started as early as April. This should shorten the fire season to a more normal length when compared to recent years. Curing of fine fuels in southern Nevada will likely begin in earnest by the first weeks of May while further north the curing of the fine fuels will be delayed until well into June or even early July.

Forests/Woodlands: Fire potential is expected to be normal to below normal over the forested areas of the Western Great Basin for the following reasons: 1) live and dead

fuel moistures have increased significantly since last year at this time, and 2) heavy mountain snowpacks will be slower to melt off thus keeping those fuels wet for an extended period into the summer.

Normal to well above normal winter precipitation across the region, normal snowmelt and average temperatures this spring have led to good to excellent moisture recovery in the heavy fuels. Unlike last year when 1,000-hour fuels reached below-normal to record low levels, a normal to wetter than normal spring this year will result in much more normal levels of dead fuel moistures through the summer months. The foliar moisture and live fuel moistures are also likely to be much higher than in recent years as soil moisture is expected to be much higher in this scenario.

Less Likely Scenario: A warm and dry spring followed by a normal to warm summer. (30% Probability)

Lower Elevations: Near to above normal winter precipitation and recent warmth has stimulated an early burst of fine fuel growth across the northern Western Great Basin and a significant crop of heavy fine fuels across the south. A rapid transition from the current weather pattern to a warm and dry pattern this spring would result in little additional fine fuel growth, leaving good horizontal continuity but generally stunted vertical development across the northern valleys and a rapid curing of the heavier fine fuels across the south. This will put large portions of the northern half of the state into normal to below normal large fire potential while areas of southern Nevada will remain above normal with a longer potential season. In this scenario, we would expect more dependency on wind to carry fires through this lighter fine fuel bed in the north.

Higher Elevations: Most 1,000-hour fuels in Nevada are currently under significant snow pack. In this scenario the warm and dry spring weather will lead to rapid melting of this snowpack and an earlier point in the summer at which these heavier fuels would be able to support large fire. However, residual moisture from the winter wet season is likely to help dampen the impacts of a dry spring, thus creating a normal potential for large fires in the timbered areas. The exception to this is the Sierra Front, where long-term dead fuel loading will elevate the area to above normal large fire potential during the typically dry summer season.

Worst Case Scenario: A cool, wet spring followed by a hot, dry summer with significant dry lightning activity. (20% Probability)

A cool and wet spring will spur abundant fine fuels growth across the lower elevations through early summer, sharply increasing the potential for large fires as the fuels cure in late spring. At the same time, 1,000-hour fuel moistures and live fuel moistures in the heavy fuels would be well above normal, decreasing large fire potential at higher elevations in the heavy timber. This scenario is considered our worst case because significant dry lightning activity in abundant fine fuels has a better chance of exceeding initial attack capabilities, resulting in a higher number of large fires.
Additional consequences of a higher number of large fires in the rangelands include greater susceptibility to invasive vegetative species and higher potential for destruction of critical wildlife habitat.

Fuels Outlook. The fuels condition outlook for Nevada will be divided into two regions and each region will again be subdivided based on elevation and fuel type. One fuels condition that cannot be forecast as this time will be the continuing Ips beetle infestation and its impact on the live Pinyon and Ponderosa pine stands across the state. The recent wet conditions may likely result in a decrease in beetle kill but its impact is unknown at this time. The existing beetle killed trees across much of Nevada will likely begin to see the red needles drop reducing fire danger to some extent though the total impact of this is also unknown.

Southern Nevada
The current heavy fine fuel crop across southern Nevada is expected to cure a bit slower than in recent years. This is due to near normal spring temperatures and the expectation that spring rainfall will continue to be above normal, especially in April and May. Curing is likely to start in early May with significant drying expected in June. The opposite can be said of the higher elevations of southern Nevada, as winter precipitation resulted in a significant increase in 1000 hour fuel moistures. This will likely delay well into summer the point at which these fuels will be capable of sustaining fire activity. It is possible that the summer monsoon season will begin before these heavier fuels have a chance to dry out.

Live fuel moisture values are anticipated to fall more slowly this summer due to adequate soil moisture. This will cause the shrubs and conifers to be greener and less available to burn through the early part of the summer.

Northern Nevada
The annual fine fuel crop across the lower elevations are currently undergoing a significant green-up with excellent horizontal continuity and the potential for average vertical growth. If the spring precipitation outlook changes significantly and becomes wetter than expected, fine fuel growth will be above average. The eventual curing of these fine fuels will be influenced by the amount and distribution of spring rainfall and whether or not temperatures rapidly rise
.
The current long range weather forecast indicates that rainfall and temperatures should be much closer to normal this spring than in recent years. Thus the curing date for many fine fuels across northern Nevada may well not occur till later in June. The curing date may also be significantly influenced if temperatures climb rapidly for a short time early in June. This could bring on a rapid curing of the fine fuels across the valleys of northern Nevada. This condition will need to be monitored as the later spring season commences.

In the higher elevations, fuel moistures in the heavier fuels are likely to be much closer to normal this year than in the past several years. Above normal precipitation and heavy mountain snowpacks will likely delay the drying of these fuels until well into the summer months, as well as allowing live fuel moistures to fall more slowly due to above normal soil moisture. This will cause the shrubs and conifers to be greener and less available to burn through the summer season.

Fire Occurrence and Resource Outlooks. Wildland fire activity in the Western Great Basin is highly dependent on the occurrence of lightning and whether or not those lightning occurrences are associated with wetting rainfall. The distribution of lightning is exceptionally difficult to forecast and varies widely from year to year and from place to place. The prediction of fire occurrence and resource impacts for this year is based on

the premise that the frequency of lightning activity will be normal and that the lightning activity will be more likely associated with wetting rain events or monsoon type thunderstorms. The National Weather Service in Reno, NV has performed a detailed analysis of lightning ignitions, and their data show that lightning-caused fires associated with monsoonal surges are of shorter duration, and typically have a 1 day burn period.

Given our expectation of lightning occurrence in combination with current fuels conditions, we project that there will be areas of above normal fire occurrence across the valleys of southern Nevada, with much of the remainder of the state near or even below normal. Except for those areas with heavy fine fuel loading, initial attack efforts should be successful, though during wind events the more continuous fine fuels statewide will lead to more significant spread rates which could require additional efforts during IA. Additional factors such as Sage Grouse habitat protection will complicate suppression strategies.

Management Implications and Concerns. At lower elevations across southern Nevada, above normal winter precipitation and mild temperatures have promoted a heavy crop of fine fuels. This has resulted in a significant increase in large fire potential across southern Nevada. Farther north the lack of significant carry over from previous years when coupled with an average continuous grass crop will lead to a more normal potential than has been seen in recent years.

In the higher elevation timber fuels, spring precipitation and temperatures will have less impact. The main factor here is the higher moisture values in the live and dead fuels, which will continue later into the season as a result of an above average snow pack and high soil moistures. Thus large fire potential in these areas is likely to be normal or even below normal.

Other considerations such as protection of critical habitat (e.g., Sage Grouse) and resource availability, could pose challenges to fire suppression operations (strategies, resource commitments, etc.) that one would not normally expect to encounter under this most likely scenario.

Land managers should expect to see more large fires across all of Nevada this year with a particular emphasis in parts of southern Nevada. Spread rates on any fire in Nevada this year is also likely to be greater than normally expected due to the more continuous crop of fine fuels. One additional mention should be made that due to the flooding rains this past winter many of the access routes into the more remote areas may be impassable due to road damage resulting in delays of ground based resources.

Increased fire occurrence in southern Nevada will tax local firefighting resources and will likely require support from surrounding dispatch centers. As the need for additional resources rises, fire managers must be cognizant of experience levels of crews and the number of individuals in new locations and positions. Fire managers and crew leaders should objectively and honestly monitor their crews' abilities and experience levels to emphasize safety and training through the season.

Daily crew briefings should include information on local fire weather and current fire behavior conditions. Specific information should include expected fire behavior, rates of spread, fuel conditions, burning index and/or energy release component, and

appropriate firefighting tactics and strategies. Local pocket cards for representative fire danger rating stations should be available to firefighters.

F. Summary and Recommendations

Near record precipitation in the southern Great Basin during winter 2004 and early 2005 has lead to well above normal snowpacks and a significant improvement in drought conditions for much of Nevada and southern Utah. However, long-term precipitation deficits will once again play a role in determining the character of the Great Basin fire season, especially in the exceptionally dry areas of southern Idaho, northern Utah and Wyoming.

The outlook for the 2005 season calls for a normal to slightly wetter than normal spring (April-May) with near normal temperatures. Our summer (June-July-August) will be normal to slightly warmer than normal, and summer precipitation is expected to be below normal in Idaho, near normal in Nevada, western Utah and western Wyoming and above normal in eastern Utah.

In Nevada, abundant rainfall and snowfall have sharply impacted drought conditions and have provided a heavy fine fuels crop and a surprisingly early green-up in the southern half of the state. **Therefore, in the Western Great Basin, most of the northern half of Nevada will have normal to possibly below normal large fire potential, while southern Nevada is likely to experience well above normal large fire potential** (see map).

Conditions in southern Utah are in large part the same as in southern Nevada. Fine fuels will exhibit loadings and continuity at elevations below 6500 feet to carry fire in the southwest corner of Utah and across much of the Arizona Strip. Farther north, the timberlands of central and southwest Idaho and western Wyoming continue to suffer from long-term precipitation deficits that have increased mortality from drought stress, disease and bug infestation problems. Large fuels that likely did not recover from last fall's dry conditions will contribute to the fire problems. **Consequently, the 2005 fire potential in Eastern Great Basin will be above normal across most of the forested lands in southwest Idaho and north of the Snake River Plain, the northern districts of the Bridger-Teton forest, and the grass and shrublands below 6500 feet in southwestern Utah and the Arizona Strip** (Figure 12).

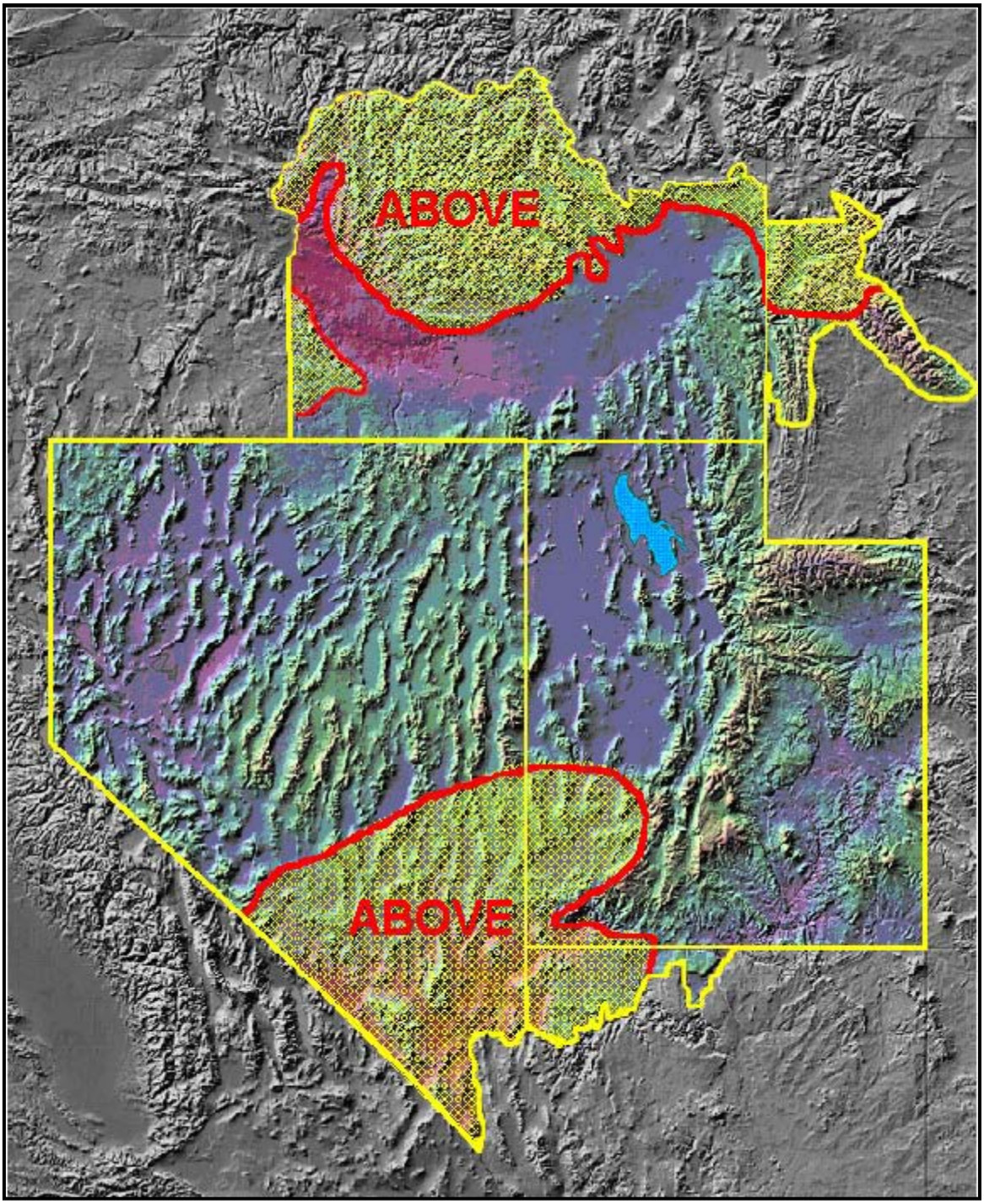

Figure 12. Seasonal fire potential outlook for the Great Basin for 2005. Highlighted areas indicated above normal potential for large fires.